

# A challenging issues and situation on maternal cardiopulmonary resuscitation and perimortem caesarian section on COVID-19 patient in 3rd trimester pregnancy

Ahmad Luqman Md Pauzi, MEmMed<sup>1</sup>, Iskasyamar Ismail, MEmMed<sup>1</sup>, Noor Hafizah Abdul Salim, DrEmMed<sup>1</sup>, Siti Farhana Md Pauzi, MOG<sup>2</sup>, Muhammad Adi Putera bin Sazali, MD<sup>3</sup>

<sup>1</sup>Department of Medicine, Universiti Putra Malaysia, Malaysia, <sup>2</sup>Department of Obstetrics & Gynaecology, Universiti Putra Malaysia, Malaysia, <sup>3</sup>Hospital Pengajar Universiti Putra Malaysia, Malaysia

## SUMMARY

Initiating cardiopulmonary resuscitation in pregnant mother with COVID-19 infection can be a challenging situation in many aspects. It needs a simultaneous effective resuscitation and a safety measure to prevent cross-infection to healthcare workers. The aim of this study is to elaborate on issues and challenges in resuscitating a pregnant patient with COVID-19 and the measure to be taken to resuscitate this type of situation. A 34-year-old gravida 3 para 2 woman at 30 weeks period of amenorrhoea presented with worsening shortness of breath for 3 days associated with productive cough and intermittent haemoptysis for 1 week prior to admission. She was intubated for severe respiratory distress which later developed into cardiorespiratory arrest. Cardiopulmonary resuscitation (CPR) was commenced with perimortem caesarian section delivery done; however, patient has succumbed to death. There is a need for simultaneous rapid multidisciplinary response in such a complicated situation. This will improve the outcome of the maternal CPR and the risk prevention of infection to healthcare workers.

## INTRODUCTION

In the era of COVID-19 pandemic, cardiopulmonary resuscitation (CPR) of a patient with a COVID-19 infection poses a challenging situation for healthcare workers. The situation involving cardiac arrest in pregnancy can be difficult to control, regulate or adapt all aspects of infective control measures when at the same time there is a need to prevent the spreading of the virus to healthcare workers. Most of the updated protocol on COVID-19 regarding resuscitation of a pregnant patient is still the same as those of non-pregnant patients; however, there is a special aspect that has been modified as it involves saving two lives at one time.<sup>1</sup> To add to this chaotic situation, the pressure arises when the decision for perimortem cesarean section is decided during resuscitation in which the delivery needs to be achieved within 5 minutes of cardiac arrest.<sup>2</sup> This article aims to describe the issues regarding maternal resuscitation and CPR in infected COVID-19 patients.

## CASE REPORT

We reported a case of 34-year-old gravida 3 para 2 woman at 30 weeks period of amenorrhoea (POA) without any

comorbidities and otherwise antenatally uneventful who presented to emergency department (ED) with worsening shortness of breath for 3 days associated with productive cough and intermittent haemoptysis for 1 week prior to admission. She also had an intermittent fever for 4 days with diarrhoea but no vomiting or abdominal pain. The patient was initially under home quarantine for the person under investigation as her husband was infected with COVID-19 infection. Upon arrival at ED, she was triaged to the decontamination room and noted to be in severe respiratory distress. She was feverish with a temperature of 38.7°C, blood pressure of 128/78mmHg, heart rate of 123bpm and saturation of 95% under high flow mask oxygen. Lung examination revealed bilateral crepitations in both lower zone.

She was intubated in view of respiratory failure and impending respiratory collapse. Her initial arterial blood gases (ABG) under high-flow mask oxygen 15L/min showed type 1 respiratory failure with pH:7.441, pCO<sub>2</sub>:24.6, pO<sub>2</sub>:78, HCO<sub>2</sub>:16.9 and base excess:-7.4. Other clinical data on admission were as follows: haemoglobin: 12.4 g/dL; white cell count: 8.8 x 10<sup>9</sup>; thrombocyte count: 311x10<sup>9</sup>; absolute lymphocyte count: 1.06 x 10<sup>9</sup>; C-reactive protein (CRP): 185mg/L; urea:3.9 mmol/L and creatinine :148 umol/L. Other parameters such as electrolyte, liver function test and coagulation profile were normal. Her chest radiograph revealed patchy bilateral consolidation of both lungs. The patient was ventilated with a high setting ventilation mode. The ABG post-intubation was worse with a type 2 respiratory failure. The real-time reverse transcription polymerase chain reaction (RT-PCR) test was positive. The impression given was severe COVID-19 pneumonia category 5 with acute respiratory distress syndrome.

One-hour post-intubation, she developed cardiorespiratory arrest and CPR was done with the activation of the obstetric red code. Multiple disciplines, including obstetrics, paediatrics, and anaesthetist simultaneously manage the patient. Lateral uterine displacement was done to relieve aortocaval obstruction while CPR was commenced. In view of the time taken for donning personal protective equipment (PPE) and preparation of perimortem caesarean section set, the delivery of foetus via perimortem caesarean section was only completed at 10 minutes after CPR commenced. Lower segment caesarean section was done with an aseptic

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Corresponding Author: Ahmad Luqman  
Email: ahmadluqman@upm.edu.my

technique. Unfortunately, the baby was born as fresh stillbirth. Subsequently, the patient had the return of spontaneous circulation; however, she developed another cardiac arrest episode within 1 hour and succumbed to death.

## DISCUSSION

COVID-19 infection in pregnancy carries a high risk of severe pregnancy complications such as more severe manifestation, ICU admission or referral to a higher level of care and intubation.<sup>3</sup> Based on the Centre of Disease Control and prevention update, nearly 70% of maternal COVID-19 cases were in the third trimester.<sup>4</sup> The risk of maternal mortality was 1.6% which is 22 times higher compared to the group of non-pregnant women with COVID-19 diagnosis.<sup>3</sup>

There are a few challenging aspects of resuscitation and maternal cardiorespiratory arrest with a COVID-19 infection. Pertaining to this case, she was intubated on admission in view of severe respiratory distress. However, there is limited data specific to the pregnant population with COVID-19 surrounding timing of intubation, use of non-invasive oxygen strategies and mechanical ventilation, as most studies excluded pregnant patients. As such, in the setting of acute respiratory failure requiring invasive mechanical ventilation, principles of care should mirror that of the non-COVID-19 pregnant patient.<sup>5</sup> Following post-intubation strategy, it is still unclear whether uterine decompression with immediate delivery of fetus will improve maternal respiratory status and how the potential benefit balances against the known operative risks in the setting of COVID-19.<sup>6</sup> However, based on fetal consideration, the prolonged hypoxia of the mother will lead to fetal hypoxemia and ultimately acidemia. This in turn will lead to the risks of prolonged fetal hypoxemia, such as stillbirth and neurologic injury. Thus, the timing of delivery in this critically ill pregnant COVID-19 patient should be based on case-by-case basis following the discussions among obstetric care, maternal-fetal medicine, neonatology, critical care, infectious disease, and obstetric anaesthesiology providers regarding pregnancy management in the setting of worsening maternal respiratory status.<sup>6</sup>

In maternal CPR, the activation of Obstetric red code will lead to various disciplines which include the obstetrician, neonatologist, emergency physician and anaesthesiologist to manage the patient at the same time.<sup>2</sup> However, in the context of COVID-19 cases, particularly pregnant women, this will make the situation very difficult to adhere to infectious control protocol where it is recommended to restrict the number of staff in the room or at the bedside COVID-19 patient at one time.<sup>7</sup> Secondly, compared with non-COVID maternal resuscitation, aerosolize generating procedures such as bagging with a bag valve mask, non-invasive ventilation, tracheal intubation, and chest compression carry a high risk of spreading the infection to medical personnel, especially when they were in close contact with the patient. The safety of the rescuer team member from different disciplines remains as a first priority and should never be compromised. Based on European resuscitation counsel 2020 on COVID-19, there are a few recommendations of PPE that

need to be complied with during CPR of COVID-19 patient as it involves multiple aerosols generating procedure.<sup>7</sup> This includes Powered Air-Purifying Respirator (PAPR) or N95 respirator or higher (if PAPR not available), goggles or face shield, gloves, isolation gown (fluid-repellent long-sleeved gown), head cover and shoe cover (in anticipating spillage and vomiting). This strict recommendation provides a challenge to the rescuer in managing maternal with COVID-19 as they need time to complete the entire donning process before starting the CPR. This is more prominent to an obstetrician as they need to be very fast in donning PPE together with preparing equipment for perimortem caesarean section delivery (PMCD) to meet the American Heart Association recommendation that PMCD should begin at 4 minutes to effect delivery at 5 minutes after failed resuscitative efforts.<sup>8</sup> The PMCD is particularly important aspect of maternal CPR as delivery of the fetus will significantly increase venous return and cardiac output to 60%.<sup>9</sup> However, in this case, the PMCD is only completed after 10 minutes of CPR due to the prolonged time taken for donning PPE and preparing the PMCD set.

Finally, there are a few changes in anatomical and physiological in pregnancy that make the resuscitation in pregnancy of COVID-19 patient more difficult. The airway in particular has various challenges in pregnancy state such as misplaced cricoid pressure and/or misaligned, increase in intra-abdominal pressure together with reducing in lower oesophageal sphincter tone making it difficult to ventilate and higher risk of aspiration, higher oxygen requirement and reduction in functional residual capacity will make pregnant mother easily desaturate during intubation and reduction of chest compliance due to ribs flaring and splinting of the diaphragm by abdominal content. This factor is particularly important for the operator assigned for intubation as the need to reduce the timing of intubation in order to reduce aerosolised air exposure duration. It is recommended that the intubation is done by senior person with more advanced equipment such as video laryngoscopy. Apart from that, the inferior vena cava is being compressed during pregnancy as the gravid uterus enlarged at the level of umbilicus estimated around 12–14 weeks POA. This will significantly reduce preload to the heart and reduce the efficiency of chest compression. As such, there is a need of additional healthcare worker to do lateral uterine displacement in order to relieve aortocaval compression. This in turn will lead to an increase in cardiac output during CPR.<sup>9</sup>

## CONCLUSION

Maternal with COVID-19 infection who need resuscitation or CPR poses a challenging condition for interdisciplinary teams. There is a need to have a proper activation such as Obstetric red code to get a simultaneous rapid team response in such a complicated situation. Thus, a clearer guideline for CPR of pregnant mothers with COVID-19 infection is needed as it deals with a highly contagious environment. This will improve the outcome of the maternal CPR and the risk prevention of infection to healthcare workers.

## REFERENCES

1. Mhyre JM, Tsen LC, Einav S, Kuklina EV, Leffert LR, Bateman BT. Cardiac arrest during hospitalization for delivery in the United States, 1998-2011. *Anesthesiology* 2014; 120: 810-8.
2. Merchant RM, Topjian AA, Panchal AR, Cheng A, Aziz K, Berg KM, et al. Part 1: Executive Summary: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation* 2020;142: S33757.
3. Villar J, Ariff S, Gunier RB, Thiruvengadam R, Rauch S, Kholin A, et al. Maternal and neonatal morbidity and mortality among pregnant women with and without COVID-19 infection: The INTERCOVID Multinational Cohort Study. *JAMA Pediatr* 2021; 175(8): 817-26.
4. CDC. Data on COVID-19 during Pregnancy: Birth and Infant Outcomes. <https://www.cdc.gov> [updated Jan. 21, 2021]. Accessed February 26, 2021.
5. Munshi L, Wright JK, Zipursky J, Jorgensen S, Bogler T, Miller KJ, et al. The incidence, severity, and management of COVID-19 in critically ill pregnant individuals. *Science Briefs of the Ontario COVID-19 Science Advisory Table* 2021; 2(43).
6. Management considerations for pregnant patients with COVID-19. Society for Maternal-Fetal Medicine. Updated February 2, 2021. Accessed February 18, 2021. [https://s3.amazonaws.com/cdn.smfm.org/media/2734/SMFM\\_COVID\\_Management\\_of\\_COVID\\_pos\\_preg\\_patients\\_2-2-21\\_\(final\).pdf](https://s3.amazonaws.com/cdn.smfm.org/media/2734/SMFM_COVID_Management_of_COVID_pos_preg_patients_2-2-21_(final).pdf)
7. Nolan JP, Monsieurs KG, Bossaert L, Böttiger BW, Greif B, Lott C, et al. Perkins. European Resuscitation Council COVID-19 guidelines executive summary. *Resuscitation* 2020; 153: 45-55.
8. Jeejeebhoy FM, Zelop CM, Lipman S, Carvalho B, Joglar J, Mhyre JM, et al. Cardiac arrest in pregnancy a scientific statement from the American Heart Association. *Circulation* 2015; 132: 1747-73.
9. Bennett TA, Katz VL, Zelop CM. Cardiac arrest and resuscitation unique to pregnancy obstetrics and gynecology. *Clin North Am* 2016; 43(4): 809-19.